1

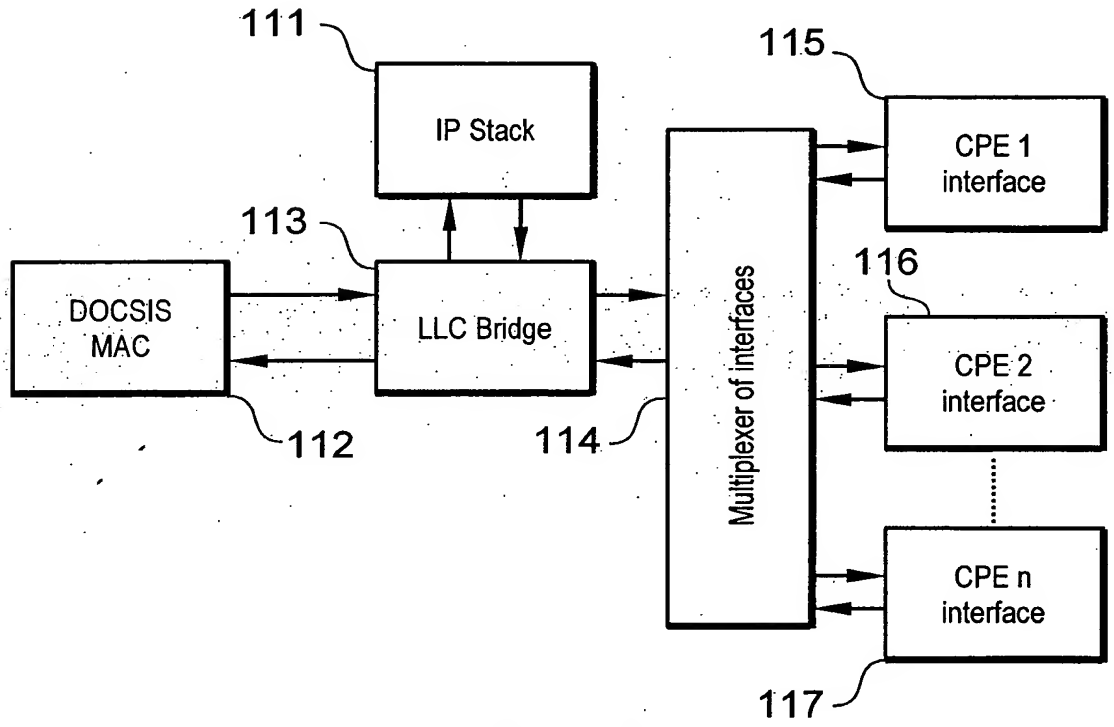
111
IP Stack
113
DOCSIS MAC
LLC Bridge
112
114
Multiplexer of interfaces
115
CPE 1 interface
116
CPE 2 interface
CPE n interface
117

Fig. 1

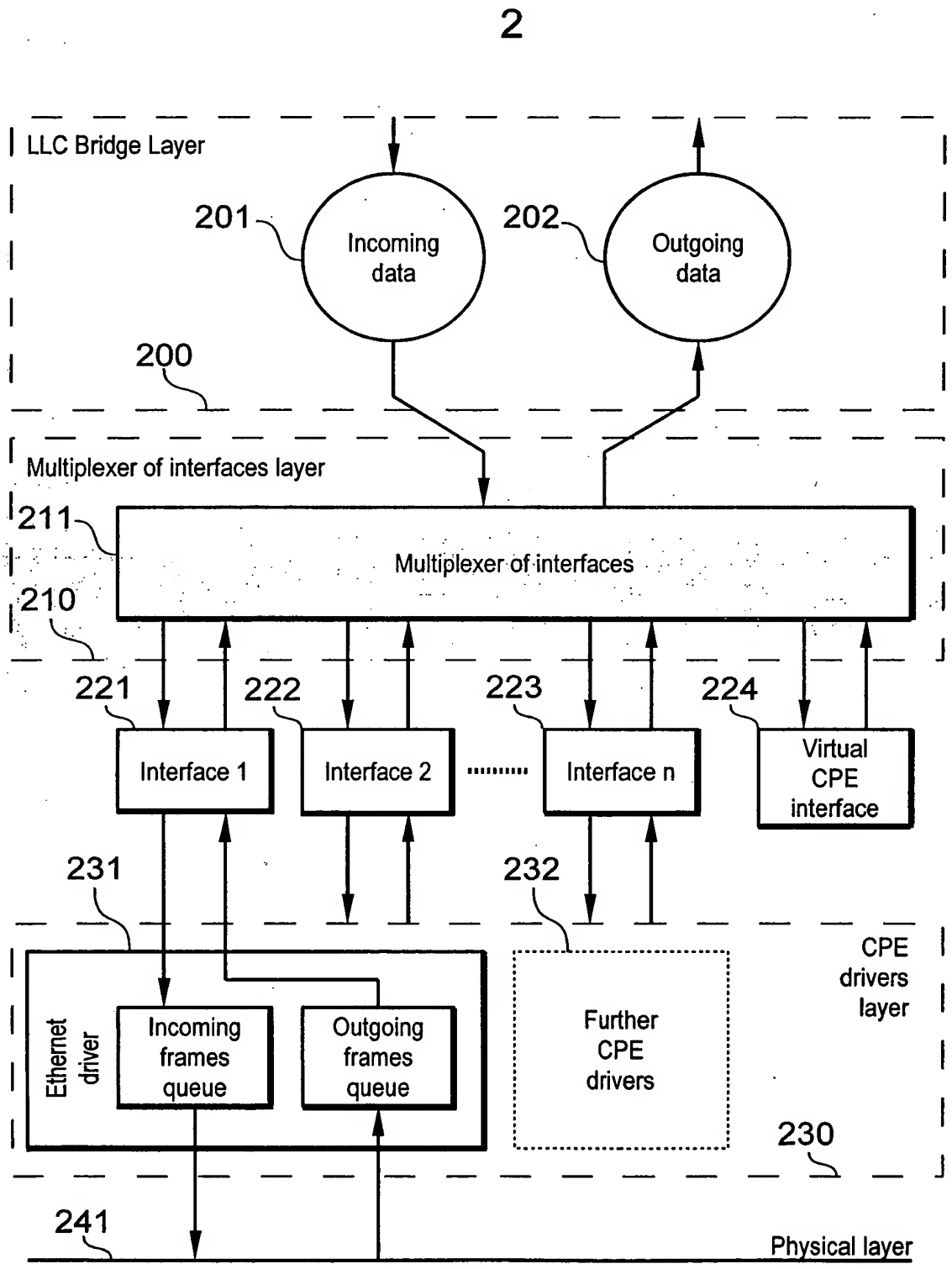
2
LLC Bridge Layer
201
Incoming data
202
Outgoing data
200
Multiplexer of interfaces layer
211
Multiplexer of interfaces
210
221
222
223
224
Interface 1
Interface 2
Interface n
Virtual CPE interface
231
232
CPE drivers layer
Ethernet driver
Incoming frames queue
Outgoing frames queue
Further CPE drivers
230
241
Physical layer

Fig. 2

3

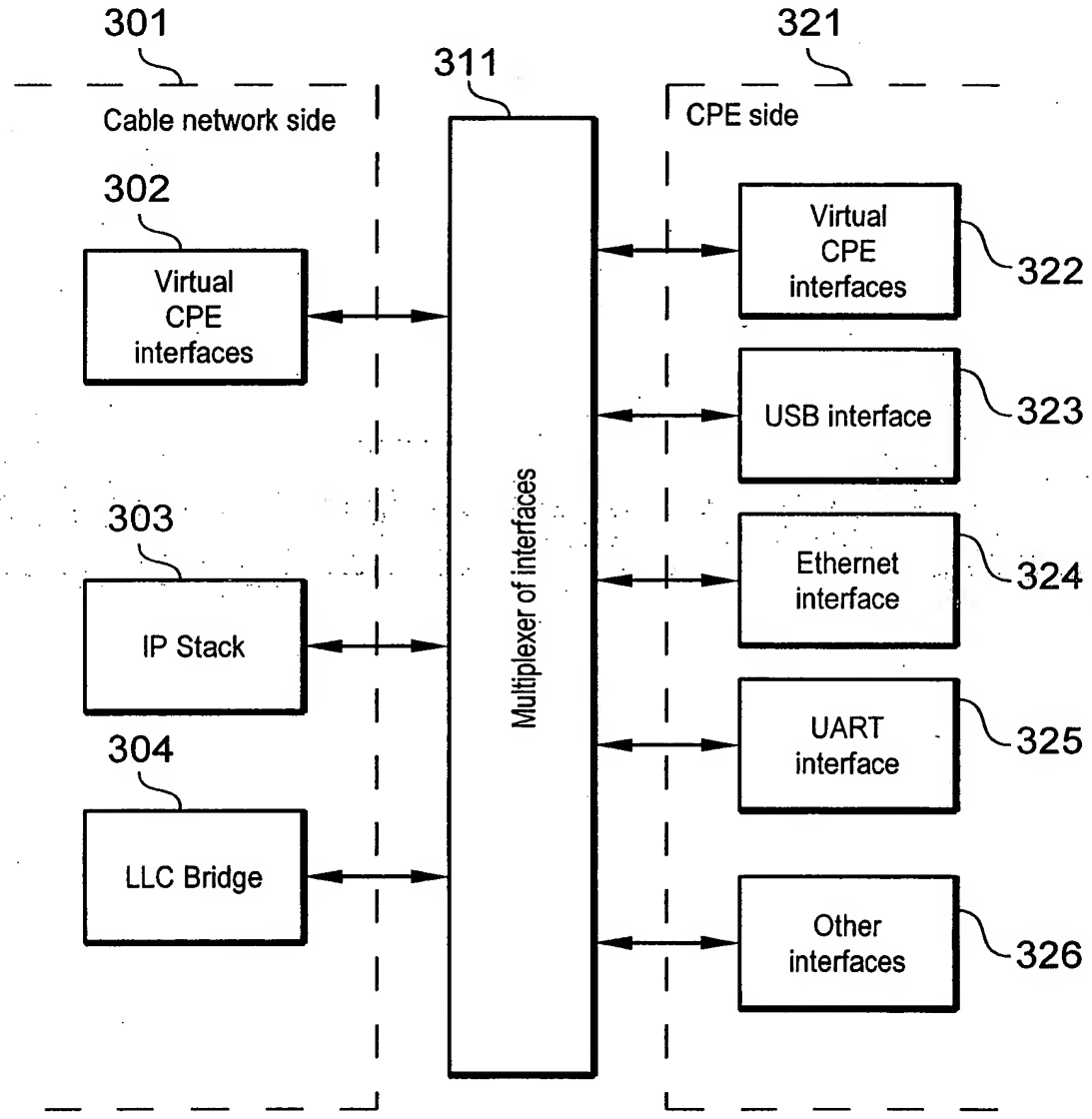
301
Cable network side
311
321
CPE side
302
Virtual CPE interfaces
303
IP Stack
304
LLC Bridge
Multiplexer of interfaces
Virtual CPE interfaces
322
USB interface
323
Ethernet interface
324
UART interface
325
Other interfaces
326

Fig. 3

4

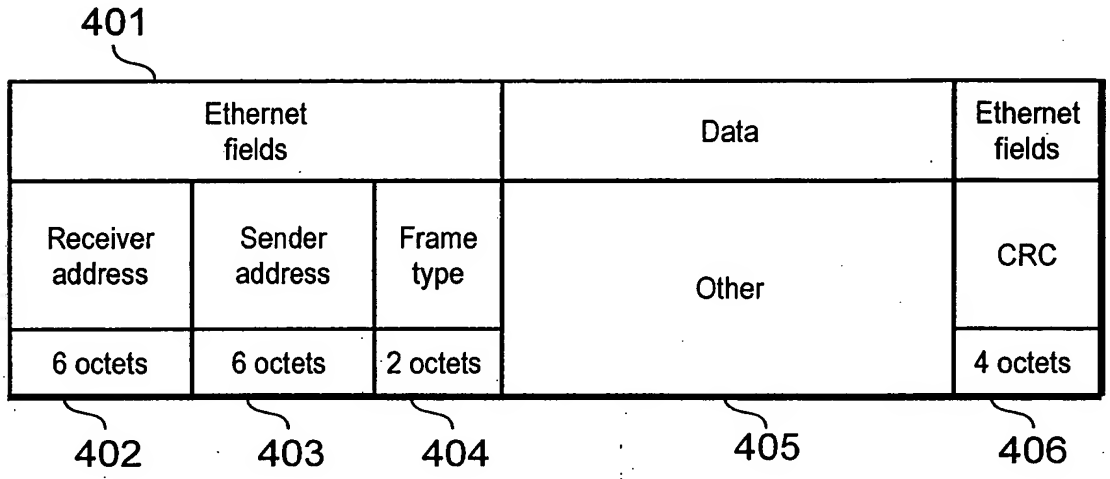
401
Ethernet fields
Data
Ethernet fields
Receiver address
Sender address
Frame type
Other
CRC
6 octets
6 octets
2 octets
4 octets
402
403
404
405
406

Fig. 4

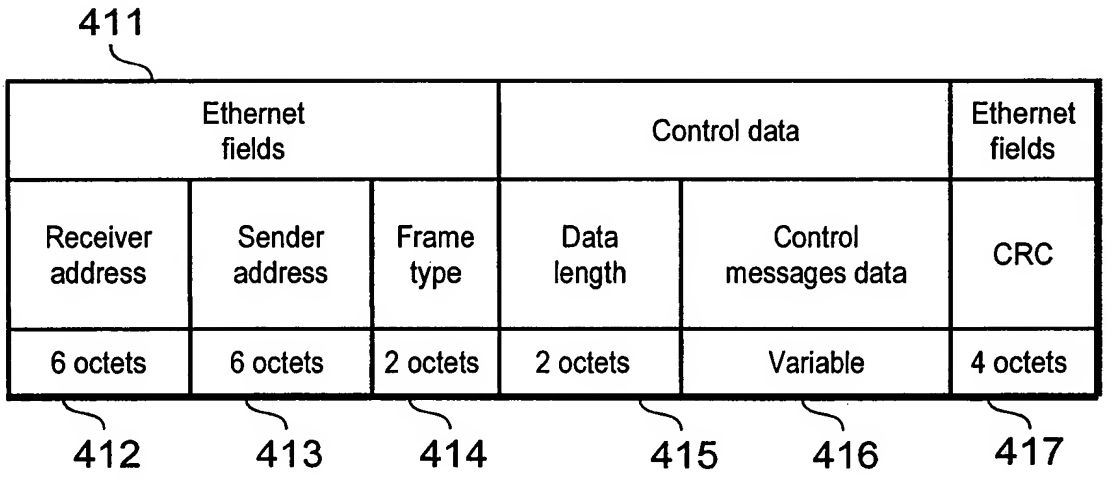
411
Ethernet fields
Control data
Ethernet fields
Receiver address
Sender address
Frame type
Data length
Control messages data
CRC
6 octets
6 octets
2 octets
2 octets
Variable
4 octets
412
413
414
415
416
417

Fig. 5

5

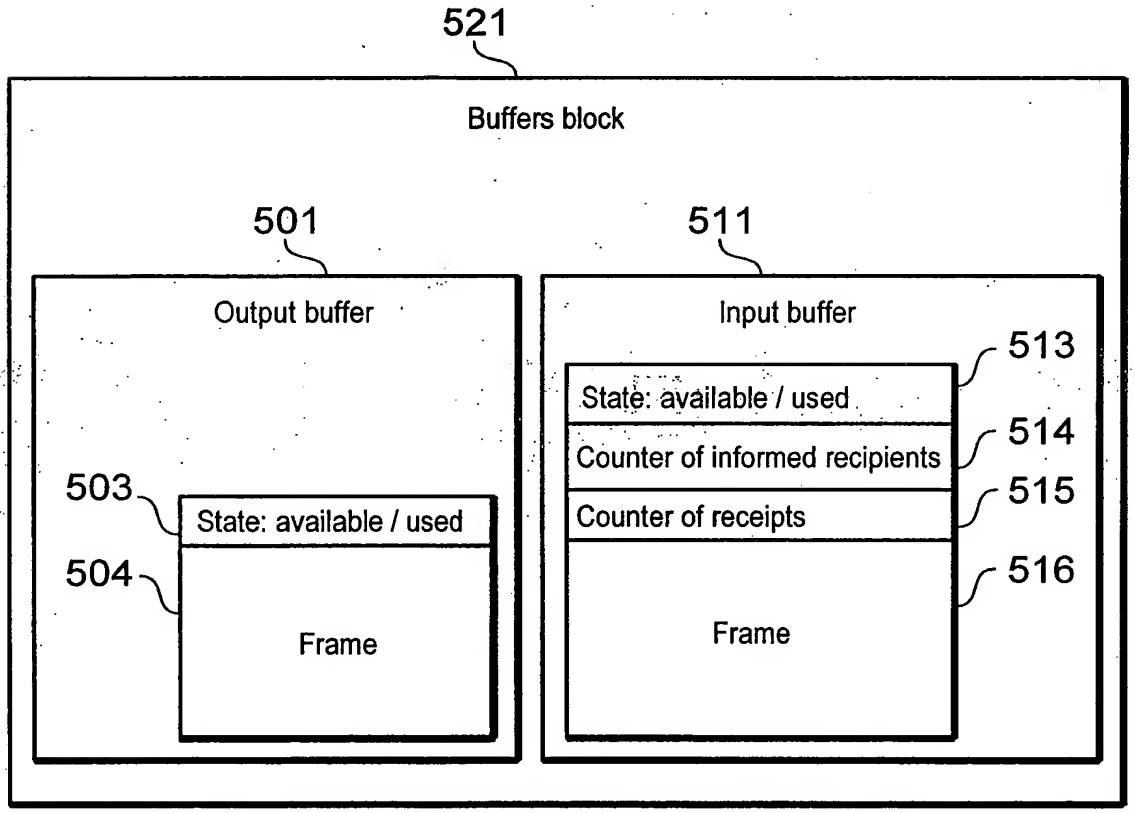
521
Buffers block
501
Output buffer
503
State: available / used
504
Frame
511
Input buffer
513
State: available / used
514
Counter of informed recipients
515
Counter of receipts
516
Frame

Fig. 6

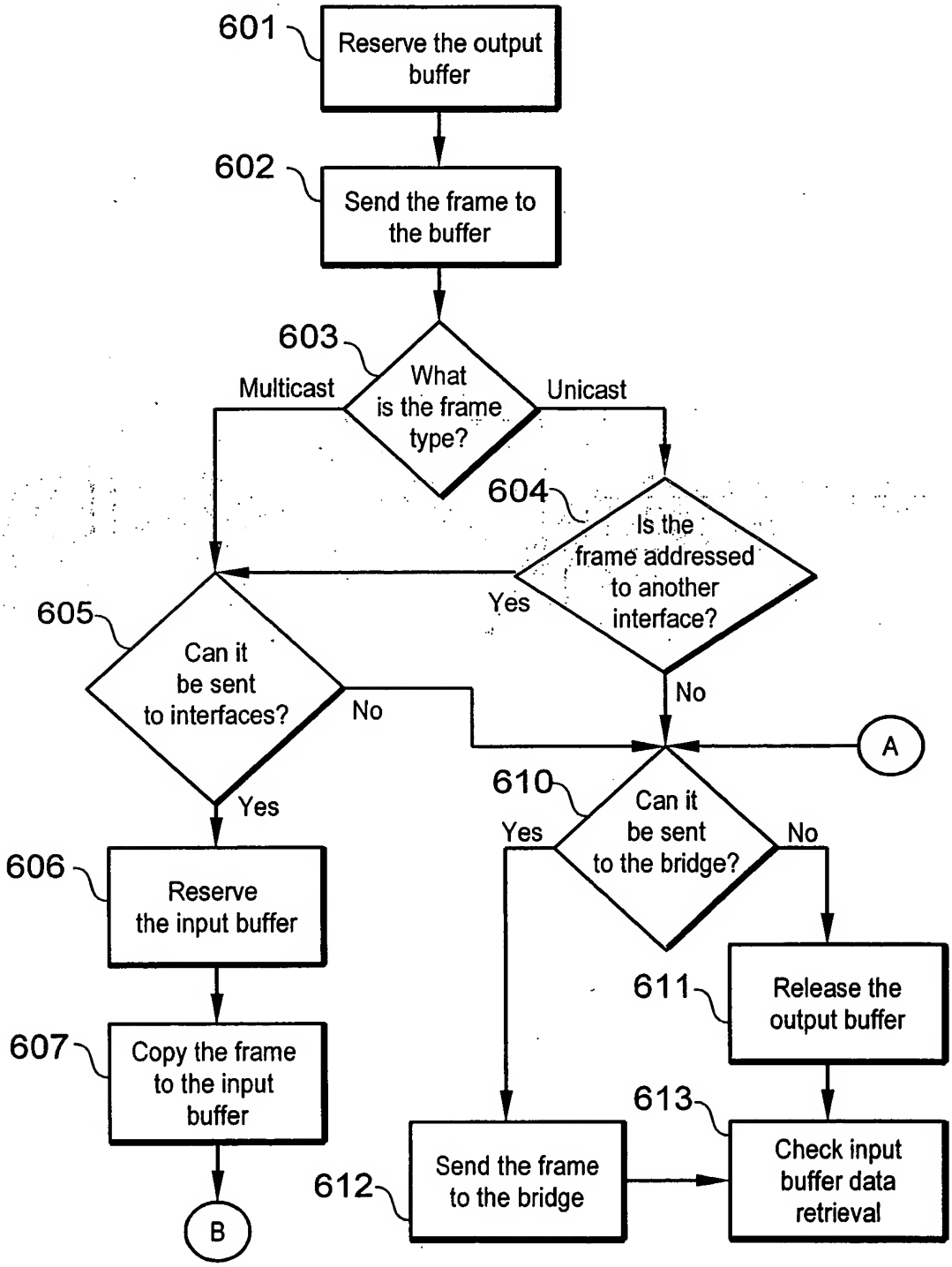
601
Reserve the output buffer
602
Send the frame to the buffer
603
What is the frame type?
Multicast
Unicast
604
Is the frame addressed to another interface?
Yes
No
605
Can it be sent to interfaces?
No
Yes
A
610
Can it be sent to the bridge?
Yes
No
606
Reserve the input buffer
607
Copy the frame to the input buffer
B
611
Release the output buffer
613
Check input buffer data retrieval
612
Send the frame to the bridge

Fig. 7A

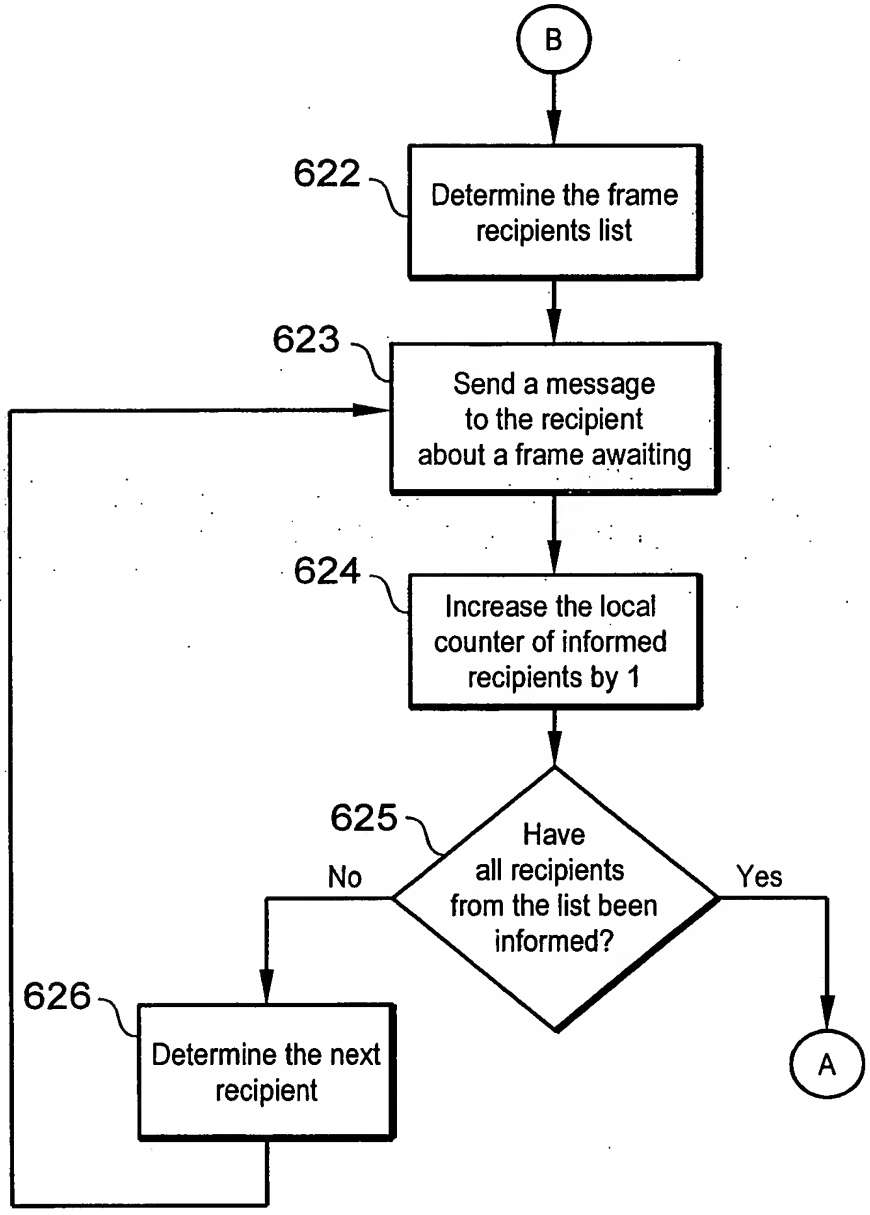
B
622
Determine the frame recipients list
623
Send a message to the recipient about a frame awaiting
624
Increase the local counter of informed recipients by 1
625
Have all recipients from the list been informed?
No
Yes
626
Determine the next recipient
A

Fig. 7B

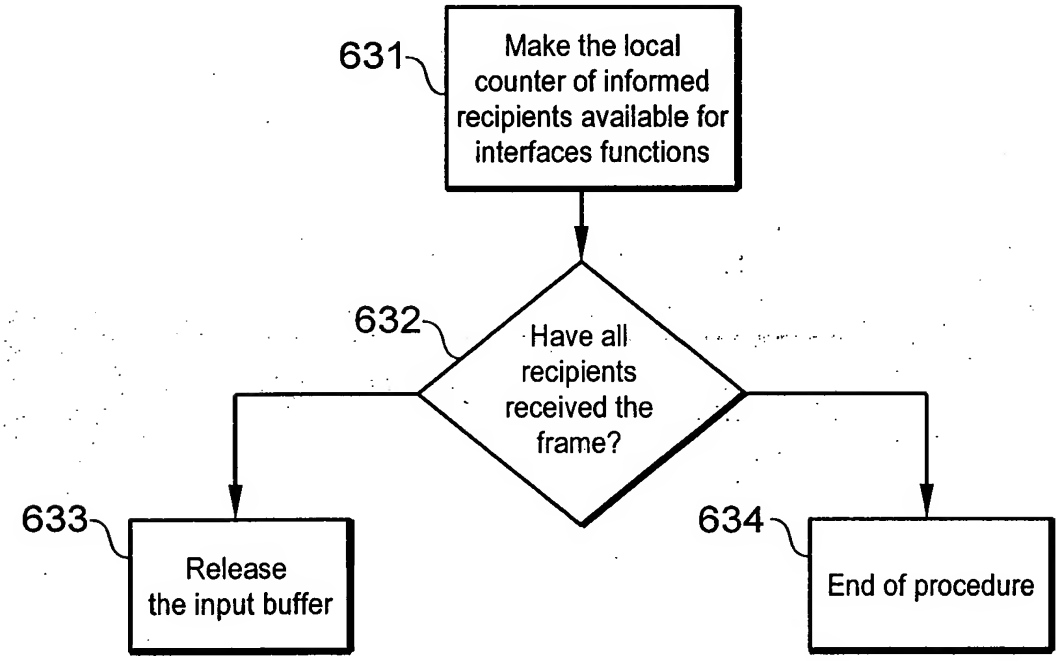
631
Make the local counter of informed recipients available for interfaces functions
632
Have all recipients received the frame?
633
Release the input buffer
634
End of procedure

Fig. 7C

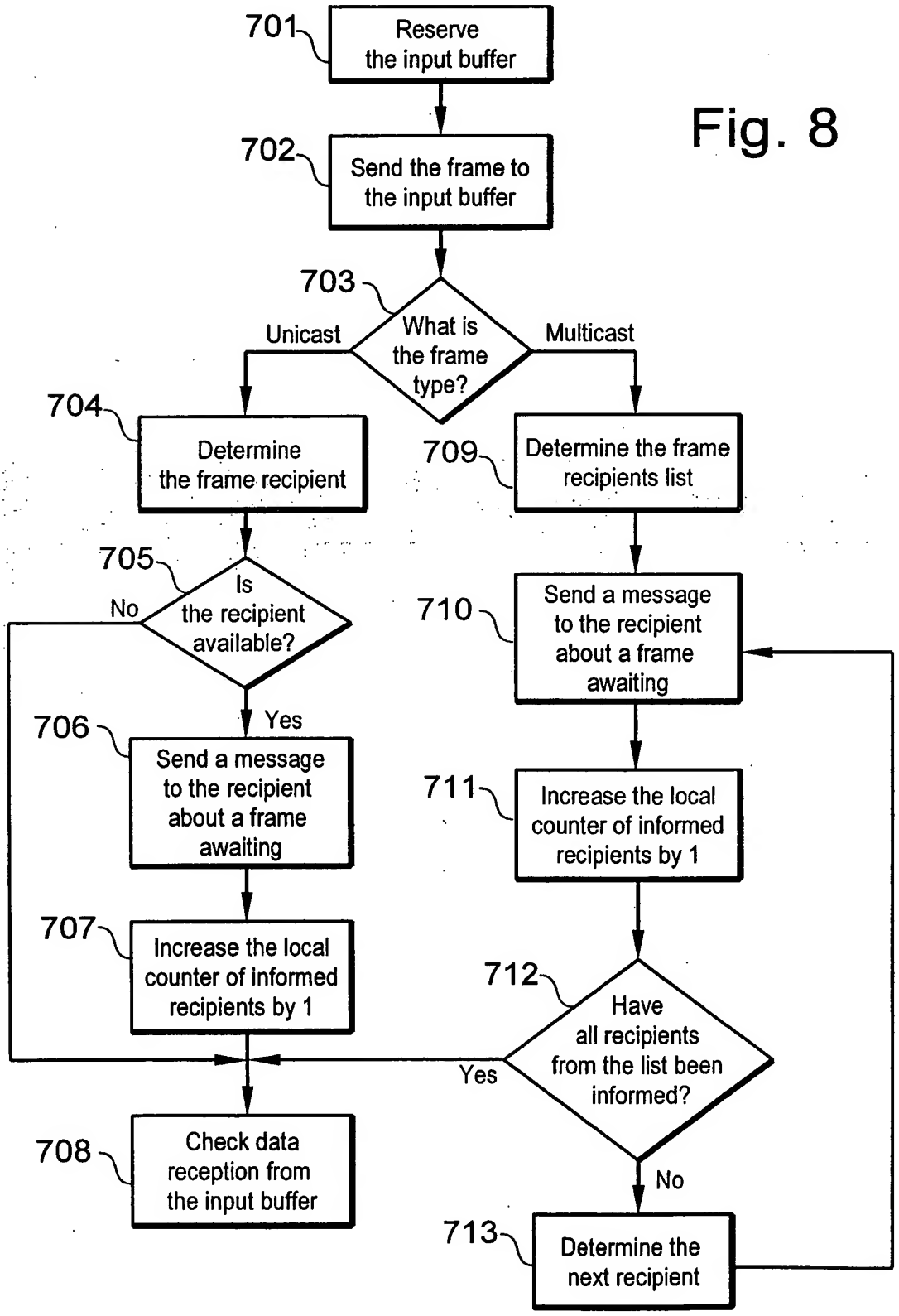
701
Reserve the input buffer
702
Send the frame to the input buffer
703
What is the frame type?
Unicast
Multicast
704
Determine the frame recipient
709
Determine the frame recipients list
705
Is the recipient available?
No
Yes
710
Send a message to the recipient about a frame awaiting
706
Send a message to the recipient about a frame awaiting
711
Increase the local counter of informed recipients by 1
707
Increase the local counter of informed recipients by 1
712
Have all recipients from the list been informed?
Yes
No
708
Check data reception from the input buffer
713
Determine the next recipient

Fig. 8

10

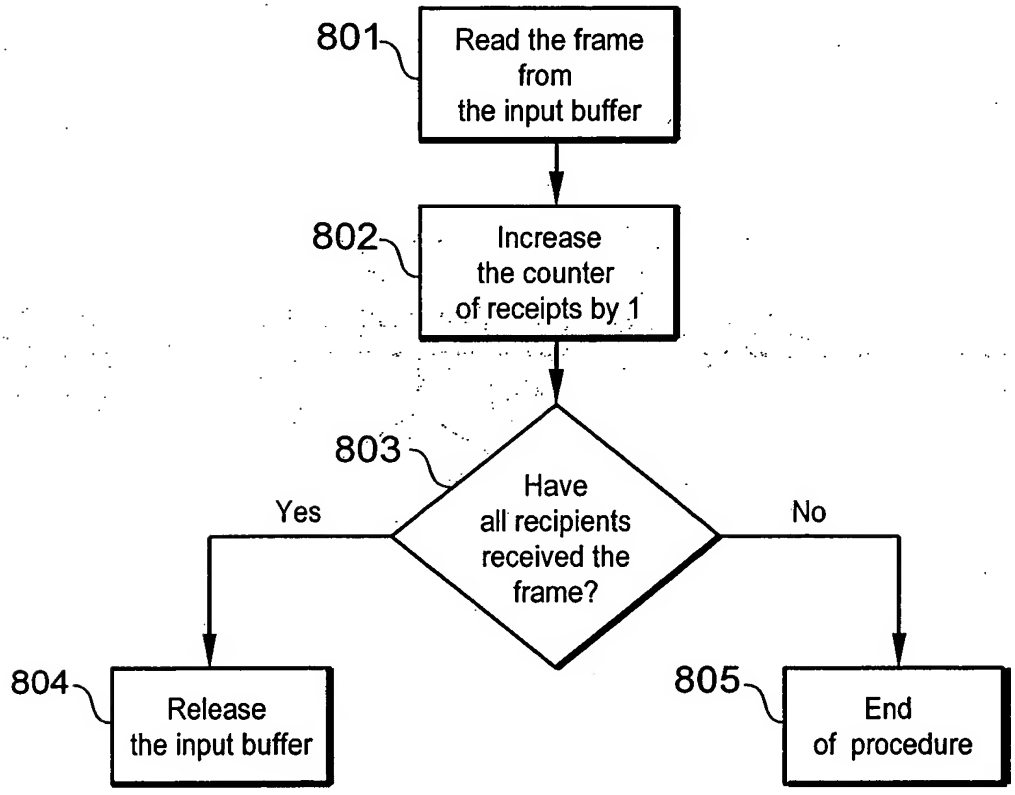
801
Read the frame from the input buffer
802
Increase the counter of receipts by 1
803
Have all recipients received the frame?
Yes
No
804
Release the input buffer
805
End of procedure

Fig. 9

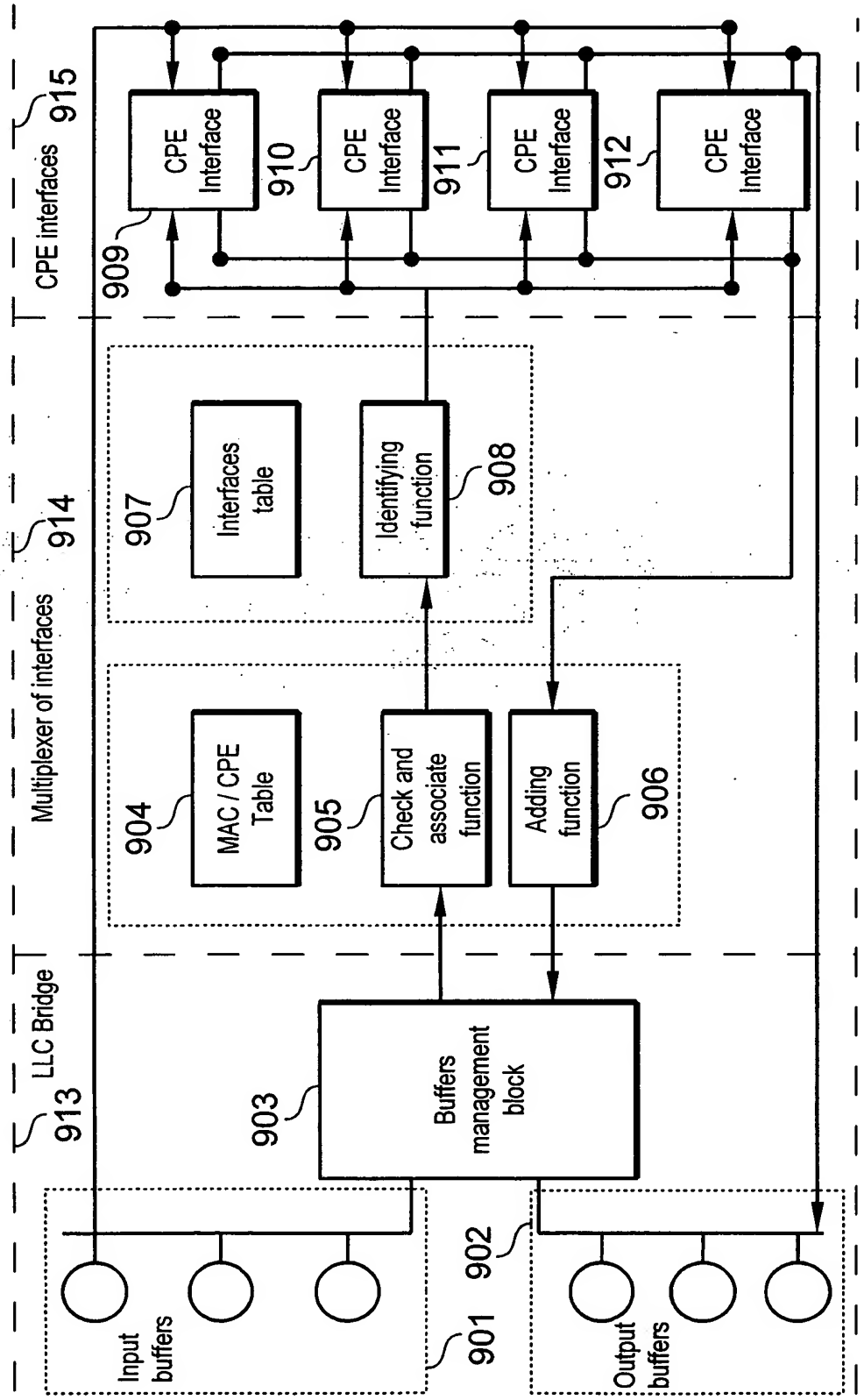
CPE interfaces
915
CPE Interface
910
CPE Interface
911
CPE Interface
912
CPE Interface
909
Multiplexer of interfaces
914
Interfaces table
907
Identifying function
908
MAC / CPE Table
904
Check and associate function
905
Adding function
906
LLC Bridge
913
Buffers management block
903
Input buffers
901
Output buffers
902

Fig. 10

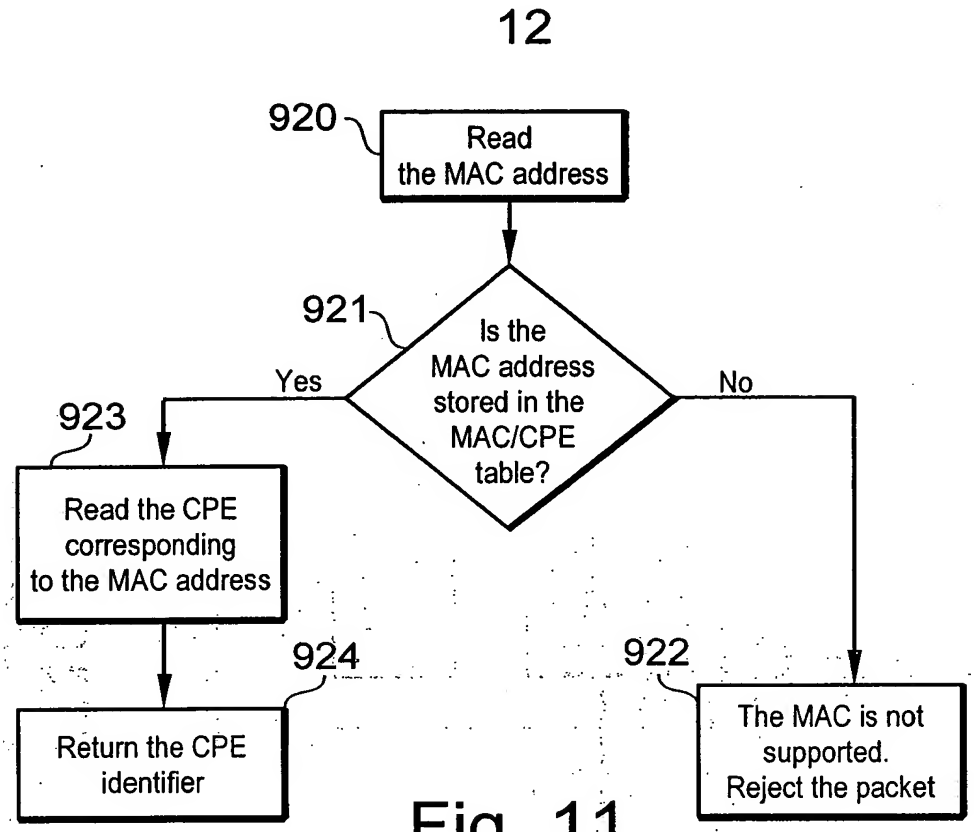
12
920
Read the MAC address
921
Is the MAC address stored in the MAC/CPE table?
Yes
No
923
Read the CPE corresponding to the MAC address
924
Return the CPE identifier
922
The MAC is not supported. Reject the packet

Fig. 11

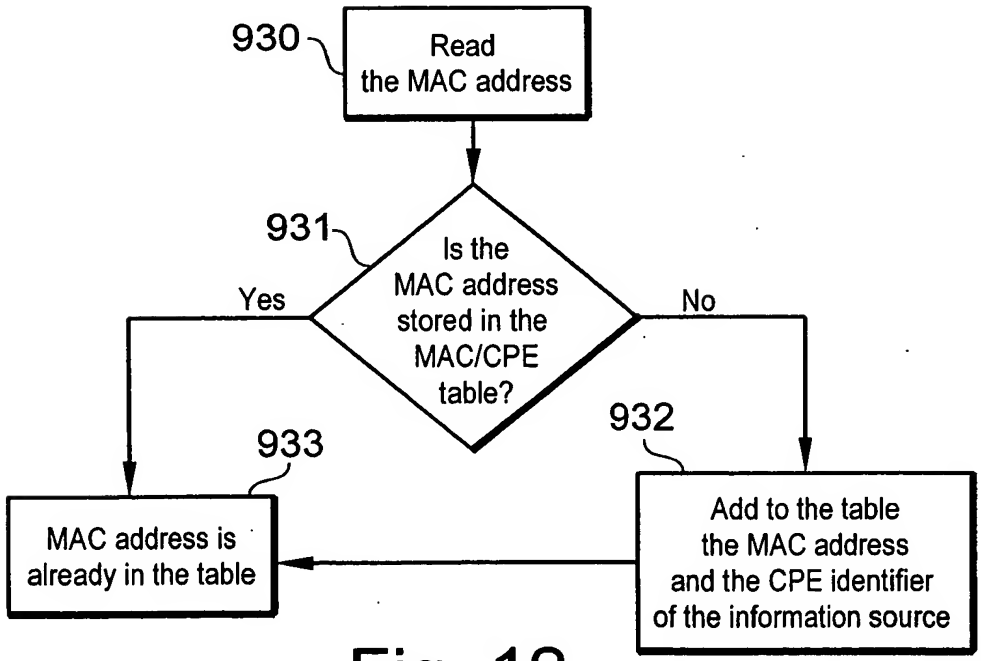
930
Read the MAC address
931
Is the MAC address stored in the MAC/CPE table?
Yes
No
933
MAC address is already in the table
932
Add to the table the MAC address and the CPE identifier of the information source

Fig. 12

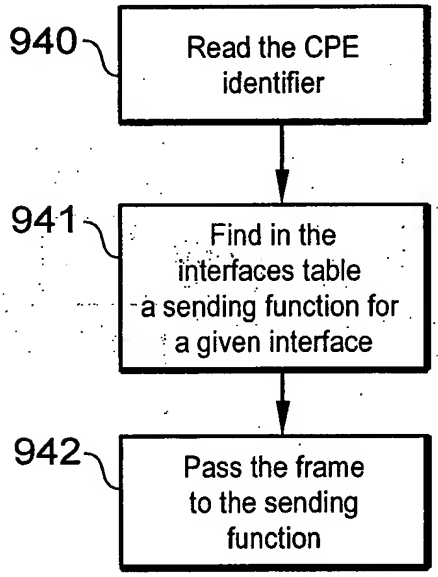
940
Read the CPE identifier
941
Find in the interfaces table a sending function for a given interface
942
Pass the frame to the sending function

Fig. 13